

# WOLF CREEK

NUCLEAR OPERATING CORPORATION

Stephen L. Smith  
Plant Manager

January 16, 2017

WO 17-0001

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

Subject: Docket No. 50-482: Licensee Event Report 2016-002-00, "Loss of Switchyard Bus Results in Emergency Diesel Generator Actuation"

Gentlemen:

The enclosed Licensee Event Report (LER) 2016-002-00 is being submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A) regarding a valid actuation of one of the emergency diesel generators at Wolf Creek Generating Station.

This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4093, or Cynthia R. Hafenstine (620) 364-4204.

Sincerely,



Stephen L. Smith

SLS/rit

Enclosure

cc: K. M. Kennedy (NRC), w/e  
B. K. Singal (NRC), w/e  
N. H. Taylor (NRC), w/e  
Senior Resident Inspector (NRC), w/e

IE22  
NRR



**LICENSEE EVENT REPORT (LER)**

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
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Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME Wolf Creek Generating Station	2. DOCKET NUMBER 05000 482	3. PAGE 1 OF 4
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4. TITLE  
Loss of Switchyard Bus Results in Emergency Diesel Generator Actuation

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	16	2016	2016	002	00	01	16	2017	FACILITY NAME	DOCKET NUMBER
										05000
										05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
5	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. POWER LEVEL	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT Cynthia R. Hafenstine, Manager Regulatory Affairs	TELEPHONE NUMBER (Include Area Code) (620) 364-4204
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED <input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE		
	MONTH	DAY	YEAR
	03	31	2017

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On November 16, 2016, at approximately 2109 Central Standard Time, while in Mode 5, a fault occurred which isolated the East Switchyard Bus from the Train "A" emergency AC plant bus NB01. During Refueling Outage 21, a modification to Transformer #7 allowed the offsite power through Transformer #7 to NB01 to be fed from either the East or West Switchyard Busses through 2 different breakers. After the loss of the East Switchyard Bus, the second breaker unexpectedly tripped which resulted in a loss of offsite power to NB01. An undervoltage condition was detected on NB01, which caused the Train "A" emergency diesel generator to start and to power NB01 as designed. The apparent cause of this event was that wiring in the Transformer #7 primary differential protective relay was landed on the incorrect termination point.

The wiring error on the primary differential protective relay was corrected and its functionality was verified. The secondary differential protective relay wiring was verified to be correct. The East Switchyard Bus, Transformer #7, and its differential relays were all restored to service.



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
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1. FACILITY NAME  Wolf Creek Generating Station	2. DOCKET NUMBER  05000- 482	3. LER NUMBER		
		YEAR 2016	SEQUENTIAL NUMBER 002	REV NO. 00

**NARRATIVE**

**PLANT CONDITIONS PRIOR TO THE EVENT**

Mode – 5

Power – N/A

There were no systems, structures, or components (SSC) that were inoperable at the start of the event and that contributed to the event.

**DESCRIPTION**

During Refueling Outage 21 (RF21), Wolf Creek Nuclear Operating Corporation (WCNOC) implemented modifications to the switchyard that allowed the Transformer #7 [EIS: XFMR] (TX7) feed to the Train "A" AC emergency plant bus NB01 [EIS: EK, BU] to be supplied by multiple sources (East and West Switchyard 345 kV Busses) instead of the pre-outage configuration where the TX7 was tied directly to the East Switchyard Bus. These enhancements were made to increase overall reliability of the offsite power sources by eliminating the condition where the loss of the East Switchyard Bus would cause a loss of the NB01 offsite power feed. Change Package 14155 documents these configuration changes.

During the course of this work, new digital relays were installed to further increase switchyard reliability and address equipment obsolescence issues. The new relays and accompanying differential protection scheme for TX7 involved many wiring terminations and multiple verification / testing methods.

During the implementation of these changes, jumpers were added to the neutral terminals of the two current transformers [EIS: XCT] (CTs) on the primary and secondary differential protective relays of TX7. The CT neutral jumper was appropriately installed on the secondary differential protective relay circuit; however, on the primary differential protective relay circuit the jumper was incorrectly landed on the "C" phase termination instead of the neutral phase.

On November 16, 2016, at 2109 hours, a fault occurred which caused Transformer #6 [EIS: XFMR] (TX6) to trip, which isolated the East Switchyard Bus as expected. Unexpectedly, the TX7 West Switchyard Bus feed was also lost thus causing a loss of AC power to NB01. This resulted in an automatic start of the Train "A" emergency diesel generator [EIS: EK, DG] (EDG). The Train "A" EDG supplied power to NB01 as designed. All other systems functioned as expected.

Shutdown cooling was being provided by Train "B" of the Residual Heat Removal [EIS: BP] (RHR) System and was uninterrupted. The West Switchyard Bus and the Train "B" AC emergency plant bus (NB02) remained stable, and the plant remained in Mode 5 during troubleshooting and restoration. Doble testing was subsequently performed on TX7 to verify no adverse impact to the transformer. No issues were identified.



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**NARRATIVE**

**DESCRIPTION (cont.)**

The TX7 digital differential relay scheme provides a standard configuration with "primary" and "secondary" protective relays, each with the capability of isolating TX7. Troubleshooting activities focused on the reason the primary relay tripped and the secondary relay did not trip. Wolf Creek technicians identified a jumper on the TX7 primary differential relay CT circuit had been improperly landed. The jumper was designed to run from the neutral circuit of one CT to the neutral circuit of the other. However, technicians had incorrectly landed the jumper from the neutral of the first CT onto the "C" phase of the other. This allowed current from the TX6 fault event to be detected in the TX7 primary differential relay circuit.

**BASIS FOR REPORTABILITY**

The actuation of the Train "A" EDG described in this event is reportable per 10 CFR 10 CFR 50.73(a)(2)(iv)(A), which requires reporting of "Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section." Paragraph (B)(8) of 10 CFR 50.73(a)(2)(iv) includes "Emergency ac electrical power systems, including: emergency diesel generators (EDGs)."

**CAUSE**

The preliminary apparent cause was a human performance error that led to the CT neutral circuit wiring on the TX7 primary differential relay being landed on the incorrect termination point. This cause is supported by the fact that this incorrect termination allowed additional current to be introduced onto the "C" phase relay circuit, which initiated the trip circuit actuation following the fault on TX6.

A preliminary contributing cause was identified that verification techniques and post-modification testing failed to identify an improperly landed termination.

The cause analysis is ongoing and includes a reconstruction of the wiring circuit.

**CORRECTIVE ACTIONS**

The wiring termination error on the TX7 primary differential protective relay was corrected, and its functionality was verified through testing of the circuit. The secondary differential protective relay wiring was verified to be correct. TX7 was tested to ensure it was not damaged or faulted. The East Switchyard Bus, the TX7 differential relays and TX7 were restored to service satisfactorily. Further corrective actions will continue to be evaluated as part of Condition Report 109467.



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		YEAR 2016	SEQUENTIAL NUMBER 002	REV NO. 00

**NARRATIVE**

**SAFETY SIGNIFICANCE**

The safety significance of this event is low. The Train "A" EDG automatically started properly when a loss of AC power to NB01 was detected. The Train "A" EDG then supplied power to NB01 as designed. All other systems functioned normally including the shutdown sequencer. Shutdown cooling was being provided by Train "B" RHR and was uninterrupted. The plant remained in Mode 5 through troubleshooting and restoration. The West Switchyard Bus and NB02 remained stable.

**OPERATING EXPERIENCE/PREVIOUS EVENTS**

LER 2012-001-01 described a catastrophic failure of the Main Generator output breaker which resulted in the subsequent loss of the East Switchyard 345 kV Bus and a trip of the main turbine. Coincident with the loss of the East Switchyard Bus, a rapid transfer of the non-safety busses from the Unit Auxiliary Transformer to the Startup Transformer occurred. A differential relay trip on the Startup Transformer resulted in a loss of the West Switchyard Bus and a loss of offsite power. The cause for the loss of the Startup Transformer (and the subsequent loss of offsite power) was that there was a phase-to-phase short circuit between two unused current transformer wires that were missing insulation sleeves. Corrective actions included repairing the wires by installing insulating sleeves, performing additional inspections on the Startup Transformer and satisfactory testing of the Startup Transformer. Additionally, Wolf Creek procedures were revised to ensure the work controls process has sufficient controls to address site vendor performance.